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Letter to the Editors

Higher erythrocyte 22:6 n -3 and 22:5 n -6, and lower 22:5 n -3 suggest higher Δ -4-desaturation capacity in women of childbearing age

Based on carefully executed labelling studies, Burdge & Wootton (2002) suggested that 28 ± 4 -year-old women possess a greater capacity for α -linolenic acid (18:3 n -3) conversion to its long-chain polyunsaturated fatty acid analogues than 24–40-year-old men. Over 21 d, fractional excursions of labelled fatty acids in total plasma lipids of women and men were 63.7 and 84.0 % for 18:3 n -3, 21.1 and 7.9 % for eicosapentaenoic acid (20:5 n -3), 5.9 and 8.1 % for docosapentaenoic acid (22:5 n -3), and 9.2 and 0 % for docosahexaenoic acid (22:6 n -3), respectively (Burdge & Wootton, 2002; Burdge *et al.* 2002). To our knowledge this is the first report to observe gender differences in conversion efficiency of specific fatty acids. The only previously reported sex difference in fatty acid status in human subjects has been the higher average total unsaturation in males compared with females (Holman *et al.* 1979). Animal, mainly rat, studies observed differences in the relative activities of Δ -6-desaturase activity (Horrobin, 1981) and a greater requirement for essential fatty acids in males (Horrobin, 1995).

The suggested sex differences prompted us to reanalyse the erythrocyte (RBC) fatty acid compositions that were recently used for the assessment of biochemical essential

fatty acid and n -3 deficiencies (Fokkema *et al.* 2002). Separate analyses were performed for babies, infants and adults, since Burdge & Wootton (2002) suggested that their observation could originate from the high 22:6 n -3 demands of the fetus and neonate during pregnancy and lactation.

None of the RBC n -3 fatty acids showed sex differences in 2–46-d-old babies (n 59) and the 3.5-year-old infants (n 33). However, in sixty-one healthy omnivorous adults (twenty-eight men, 22–49 years; thirty-three women, 22–47 years) we found higher RBC 22:5 n -3 in males, compared with females ($P < 0.0001$, Student's t test). In women, 22:6 n -3 was higher but this did not reach statistical significance ($P = 0.075$). This 22:6 n -3 difference nevertheless became significant ($P < 0.029$), when eight vegans (five men, 25–37 years; three women, 29–42 years) were included (Fig. 1). No such differences were observed in the n -6 series of RBC fatty acids, apart from higher RBC 22:5 n -6 in women, compared with men (0.55 v. 0.47 mol %; $P = 0.002$). The encountered lower 22:5 n -3, in combination with higher 22:6 n -3, in women is in agreement with the higher 18:3 n -3 to 22:6 n -3 conversion capacity observed by Burdge & Wootton (2002). In addition, our data also suggest higher conversion rate to 22:5 n -6 and this thereby adds to the notion that women of childbearing age exhibit increased Δ -4 desaturation takes place through initial elongation, subsequent Δ -6 desaturation and a final chain shortening by peroxisomal β -oxidation (Sprecher *et al.* 1999). It is as yet unclear which of these account for the observed gender differences. Δ -6 desaturation and notably peroxisomal β -oxidation seem the most likely candidates. More studies are necessary to shed light on this topic and to test whether our observation is indeed caused by higher Δ -4 desaturation activity and not, for example, by gender-specific fatty acid dietary intake or degradation by mitochondrial β -oxidation.

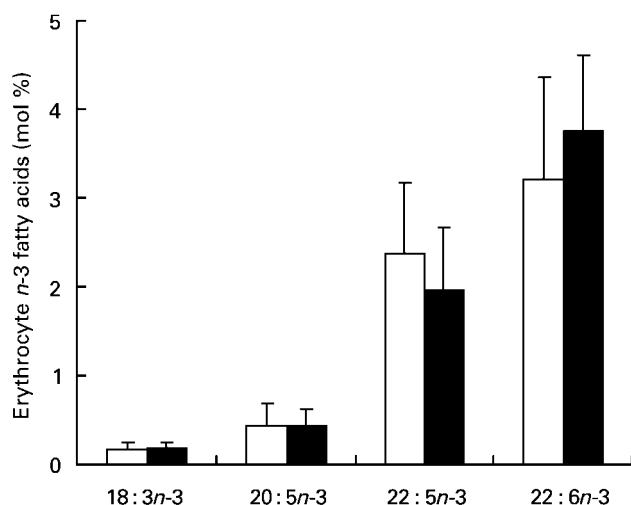


Fig. 1. Relative amounts of erythrocyte n -3 fatty acids in thirty-three men (□) and thirty-six women (■). Mean values are shown, with standard deviations represented by vertical bars.

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Abbreviation: RBC, erythrocyte.

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